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(54) Process for Producing Paints by Mixing Predetermined Quantities of Liquid Products

(57) A process for producing paints by mixing predetermined quantities of colorant products with varnish base products, comprising the following phases: (a) Preparation of a liquid monobase containing predetermined quantities of a binder element and a filler element or filler, the proportion of these quantities depending on the quality of the desired finished paint; (b) addition to the liquid monobase product, in agreement with the proportional formulas optimized and predetermined according to the color of the desired finished paint, of the predetermined quantities of at least one liquid component selected from the group including a liquid component containing titanium white, TiO_2, and a liquid component containing a filler element or filler. To obtain colors of the desired finished paint that differ from white, predetermined quantities of liquid components containing coloring pigments are added to the liquid monobase.

Specification

[0001] The present invention pertains to a process for producing paints, especially by mixing predetermined quantities of liquid products. It also pertains to a system for measuring the dyeing and to a liquid base product for preparing the paints.

[0002] The processes for producing colored paints have been based for some time on the so-called dyeing-measuring systems. The basic idea of these systems is to dye a base product having good guaranteed covering characteristics, e.g., due to the presence of a predetermined percentage of titanium white, TiO_2, with small, predetermined percentages of colored pigments, by mixing the two together and with the base product, which leads to the finished paint with the desired color. The percentages of colorants necessary to obtain a specific color are established by the proportional formulas studied by the manufacturers of the colorant bases. However, the sole use of base products containing TiO_2 does not make it possible to obtain all the colors of the entire chromatic range. Even though the covering power of a black pigment is very high, e.g., it will never be possible to obtain a completely black paint if the base product contains small and even very minor percentages of TiO_2, which is generally known to have a white color: The white color of this TiO_2 would inevitably contaminate the black and consequently lead to a paint that would be more or less gray. Consequently, dyeing-measuring systems were proposed for obtaining the color black as well as many other very dark colors. These systems comprise, in addition to the group of base products containing predetermined percentages of TiO_2, a transparent base product, i.e., a product without TiO_2 containing a neutrally colored or only slightly covering thickener product as the major component, called a "filler" (mastic), which is used to impart body to the finished paint so that it will assume the desired consistency.

[0003] For the above reasons, provisions must necessarily be made even in the most "summary" prior-art dyeing-measuring system for selecting and using a base product selected from a group comprising at least two distinct base products, depending on the color of the desired finished paint: A white base product containing high percentages of TiO_2, typically around 20%, and a neutral product, without TiO_2. The selection of one base product or another is normally performed by a specialized personnel depending on the indications provided by the colorant manufacturers relative to the specific color of the desired finished paint.

[0004] In such a dyeing-measuring system, which is limited to only two base products, the optimal yield is obtained, of course, in general, only for the colors that are at the two ends of the chromatic range, i.e., for the very dark colors (neutral base products must be used to obtain these) or for the pastel colors (prepared from white base products with a high TiO_2 content). Some colorant manufacturers have proposed dyeing-measuring systems that use more than two base products to attempt to also obtain optimal results in the intermediate range of colors between the dark shades and the pastel colors, whereas other manufacturers have even proposed colored bases, in addition to the white bases, with different TiO_2 contents as well as neutral or transparent bases. Even dyeing-measuring systems which provide for the selection and the use of a base product chosen from a group comprising up to 10 different types have been proposed in certain cases, depending on the color of the desired finished paint.

[0005] It is noted immediately that the dyeing-measuring systems are evolving toward increasingly large numbers of base products, toward the search to optimize the use of colored pigments, which are certainly expensive and often also cause pollution, in order to reduce the percentages necessary for producing all the colors of the chromatic range, while guaranteeing satisfactory covering characteristics. However, this evolution comprises serious disadvantages in the production of finished paints because more highly specialized personnel is needed to select the correct base product, in order to obtain the desired colored paint. The use of different base products also involves an increase in the necessary amount of stocks to always guarantee the availability of the most appropriate base product to obtain a specific paint. High costs and long times are, of course, involved in the industrial manufacturing processes and the management of the different base products, including the commercial management. Paradoxically, one would very soon face the same problems (large stocks in the warehouse and low product rotation) that led to the adoption of the first dyeing-measuring systems in the past if the most recent trend, namely, the supply of an ever-increasing number of base products, is pushed to the extreme.

[0006] The drawbacks illustrated above are amplified by the fact that paints with different physicochemical characteristics must normally be produced depending on the applications, and a different group of base products, as defined by the dyeing-measuring system adopted, has to be provided for each type of paint. Consequently, if varnish products intended for different uses are desired, which are suitable, e.g., for the interior or the exterior, for being applied to different surfaces (wood, stone, brick, glass, paper, etc.), for professional use or for do-it-yourself use,

with special transpiration and mildew-proof characteristics, of high or low quality, etc., the conventional systems that measure the dyeing require the stocking of an enormous number of bases, which leads to some problems that can be easily imagined, namely, in terms of management, supply and storage.

[0007] The object of the present invention is to eliminate the shortcomings of the prior art and, in particular, to completely overcome the problems arising in connection with the evolution of the dyeing-measuring systems and the most recent trends as briefly discussed above. The object of the present invention is especially to provide a method for producing paints that can be carried out in a simple manner and, if possible, automatically such that an unskilled user will be able to obtain a colored paint as desired without having to be concerned with selecting the most appropriate base product each time to obtain the desired final color of the finished product.

[0008] Another object of the present invention is to provide a paint production system that makes it possible to optimize the colored pigments and the covering power of the finished paint.

[0009] To accomplish the above-mentioned objects, the present invention pertains to a process of the type mentioned in the introduction to this specification, which is characterized in that it comprises the following phases:

a) preparation of a monobase comprising proportionally predetermined quantities of a binder element and a filler element or filler;
b) the addition of at least one liquid component selected from the group comprising:
- a liquid component containing titanium white, TiO_2;
- a liquid component containing a filler element or filler

[to] a liquid monobase during the preparation of the finished paint in agreement with a proportional formula optimized and predetermined according to the desired color of the said finished paint.

[0010] To obtain a finished paint of a color different from white, one or more liquid components containing pigment or colorant elements are added to the liquid monobase.

[0011] In other words, the basic idea of the present invention is to initially prepare a single liquid product, which we will call by the term "monobase" in the following specification, and

which is ready for use for formulating paints of any desired color by adding titanium white, pigments and filler in a selective and optimal manner.

[0012] Finally, the present invention makes it possible to formulate the base product, as defined in the traditional sense of the term, as a function of the color to be obtained, which radically distinguishes it from the already existing dyeing-measuring systems, in which the different base products are formed by the manufacturer in a strictly pre-established manner.

[0013] The advantages of the present invention can be immediately recognized. First of all, the quantities of the products being stocked are considerably reduced because it is necessary, in general, to stock only colorants, titanium white and filler and, in addition, a single other base product for each specific application, which will be justly identified in the following description by the said term "monobase" in order to distinguish it from the base products of the conventional systems that measure the dyeing.

[0014] Another important advantage arises from the fact that according to the present invention, it is possible to optimize at the same time the covering power of the finished paint. In fact, it must be taken into consideration that most of the cost of a finished paint is represented by the colorants or pigments used to prepare it, which normally also pollute the environment and must consequently be disposed of in an appropriate manner, which logically leads to additional costs, e.g., for the containers containing same. By being able to vary the titanium white, TiO_2, content as a function of each specific shade, it is possible to reach the optimal minimum level of colorants that is necessary to obtain the same shade without the need to add, e.g., excess amounts of colorants to correct or compensate an excess of TiO_2 in the traditional base product, as was necessary in the prior art.

[0015] Another advantage of the present invention is the possibility of nearly completely automating the production of finished paints. As it is not necessary to have specialized personnel to select the type of base product most appropriate for producing a finished product of the desired color, it is possible to build a dispensing machine which distributes the predetermined quantities of colorants, TiO_2 and filler, in addition to possible thinners and additives, in water or solvent in a can or container prefilled with monobase product in order to obtain the paint of the desired color.

[0016] Other characteristics and advantages will appear from the detailed description which will be given with reference to the exemplary embodiments, which must not, however, be considered to be limiting for the present invention.

[0017] In general, a finished paint comprises the following principal elements or group of principal elements, which determine its physicochemical properties:

a) one or more film-forming or binder substances, to which the hardness and the brightness of the painted surfaces is attributed, among which we mention, e.g., the synthetic resins such as the phenolic, acrylic, alkyd and epoxy resins, the styrene and polyurethane resins, etc., or the cellulose derivatives (e.g., nitrocellulose and acetocellulose) or the natural resins (e.g., copal), and others, which are normally known to the person skilled in the art;

b) filler substances, fillers or thickeners, e.g., calcium carbonate ($CaCO_3$), which imparts body to the paint or varnish;

c) a diluent, such as a solvent or water;

d) one or more pigments, including titanium white (TiO_2), and/or the various types of natural or synthetic, organic or inorganic colored pigments, which intrinsically have different covering powers;

e) various additives, such as mildewproofing, antifermentative, siccative, and antiskinning compounds, etc.

[0018] According to the present invention, a single monobase product is prepared and it will contain predetermined proportions of binder and filler, which are diluted in water or a solvent depending on the use and the characteristics of the finished paint product. The additives, whose percentages in a paint are generally low, may be added already to the monobase or later, at the time of preparation of the finished paint.

[0019] To produce a finished paint having any selected color in the entire chromatic range, predetermined percentages of filler and pigments are added to a predetermined quantity of monobase product, selected as a function of the final use of the paint (rather than on the basis of the color the paint shall have, as happens, by contrast, in the traditional systems that measure the dyeing), the addition being preferably carried out by means of a dispensing machine, and the

pigments added also include the usual colored pigments such as titanium white (TiO_2), so that the sum of the quantities of the monobase product and the additional filler and pigments (in addition to the possible additives in the case in which they are added to the monobase and are not already dispersed in the latter) shows the desired total quantity of paint with the desired color. The percentages of filler and pigments are defined by the manufacturer of the monobase product and the colorants according to a predetermined formula, which determines the optimal ratios of the different components so as to provide an optimized finished paint for each color of the chromatic range.

Example 1

[0020] The high-quality paints have a high content of binder and pigments, which are more expensive than the filler, but this leads, however, to a paint with good covering power and a good yield, thus making this paint more suitable for professional use.

[0021] To obtain a high-quality paint of ivory color, it is necessary to select a monobase product of high quality containing about 35% of one or more binder substances and about 20% of a prior-art filler component and, in addition, possibly about 14% of additives, all diluted in water or a solvent, e.g., depending on the type of the binder or film-forming substance and, finally, the final use for which the finished paint product to be produced is intended.

[0022] To obtain a certain final volume of paint, to which corresponds a value equal to 100%, a parameter we call the "fill level," a preparation already containing about 72% of the fill level of the above-described monobase product is used as the starting material. To reach a fill level of 100%, the user or the dispensing machine will add to this monobase product about 28% fill level of additional components, which are schematically distributed as follows: 25% of TiO_2 in water or a solvent and 3% of universal yellow colorant. After mixing the monobase with the additional components, the resulting paint has an ivory color of high quality due to the presence of a large quantity of binder, equaling about 25% of the total.

Example 2

[0023] A monobase identical to that indicated in Example 1 is used as the starting material to obtain a high-quality paint of gray color.

[0024] A preparation already containing about 72% of the above-described monobase is used as the starting material to reach a fill level equal to 100%. The user or the dispensing machine must add to this monobase about 28% of additional components distributed schematically as follows: 100% of TiO_2 in water or a solvent and 3% of universal black colorant known to have a higher covering power than the universal yellow colorant and, in addition, 15% of filler.

Example 3

[0025] A monobase identical to that mentioned in Example 1 is used to obtain a high-quality paint of black color.

[0026] A preparation already containing about 72% of the above-described monobase is used as the starting material to reach a fill level equal to 100%. The user or the dispensing machine adds to this monobase about 28% of additional components, which are schematically distributed as follows: 10% of universal black colorant and, in addition, 18% of filler.

Example 4

[0027] Contrary to the high-quality paints, the paints of low quality have a higher content of filler, which is less expensive than the binder and the pigments, and are consequently more suitable for use by do-it-yourselfers.

[0028] The starting material used to obtain a low-quality paint of ivory color is a monobase containing about 11% of one or more prior-art binders and about 44% of a prior-art filler and, in addition, possibly about 11% of additives, all diluted in water or a solvent, depending on the characteristics of the binder (film-forming substance) and, finally, on the use for which the finished varnish product to be produced is intended.

[0029] A preparation already containing about 90% of the above-described monobase is used as the starting material to reach a fill level equal to 100%. The user or the dispensing machine must add to this monobase 10% of additional components, which are schematically distributed as follows: 9.5% of TiO_2 in water or a solvent and 0.5% of universal yellow colorant. After mixing the monobase with the additional components, the resulting paint is a paint of low quality

because of the presence of a large amount of filler, equaling about 40% of the total paint, relative to the binder.

Example 5

[0030] A monobase identical to that mentioned in Example 4 is used as the starting material to obtain a low-quality paint of gray color.

[0031] A preparation already containing about 90% of the above-described monobase is used as the starting material to reach a fill level equaling 100%. The user or the dispensing machine must add to this monobase about 10% of additional components, which are schematically distributed as follows: 3% of TiO_2 in water or a solvent and 0.5% of universal black colorant as well as 6.5% of filler. After mixing the monobase with the additional components, the resulting paint is a paint of low quality because of the presence of a large amount of filler, exceeding 45%.

Example 6

[0032] A monobase identical to that mentioned in Example 4 is used as the starting material to obtain a low-quality paint of black color.

[0033] A preparation already containing about 90% of the above-described monobase is used as the starting material to reach a fill equal equaling 100%. The user or the dispensing machine must add to this monobase about 10% of additional components, which are schematically distributed as follows: 3% of universal black colorant as well as 7% of filler. After mixing the monobase with the additional components, the resulting paint is a paint of low quality because of the presence of a large amount of filler, equaling about 47% of the total paint.

[0034] The various percentages indicated in the above examples are given essentially to make it possible to make comparisons, and they must not be considered to be limiting nor to consequently reduce the possibilities of carrying out the process and the possible embodiments of the present invention, which can be specifically carried out by a person skilled in the art capable of understanding the teachings contained in this specification. The percentages in the above examples are reviewed in Table 1 below for the purposes of comparison only.

Table 1

Type of monobase (composition)	Type of paint	Monobase content	Pigment content	Filler added
High Quality approx. 35% of binder, 20% of filler, 14% of additives, and solvent or H_2O as needed	H.Q. Ivory	72% monobase High Quality	25% of TiO_2 3% of yellow colorant	0%
	H.Q. Gray		10% of TiO_2 3% of black colorant	15%
	H.Q. Black		0% of TiO_2 10% of black colorant	18%
Low Quality Approx. 11% of binder, 44% of filler, 11% of additives and solvent or H_2O as needed	L.Q. Ivory	90% monobase Low Quality	9.5% of TiO_2 0.5% of yellow colorant	0%
	L.Q. Gray		3% of TiO_2 0.5% of black colorant	6.5%
	L.Q. Black		0% of TiO_2 3% of black colorant	7%

[0035] The difference between the two types of paint, the high and low quality paints, is shown as an example to indicate that the only choices that the user must make during the preparation of a finished paint are the selection of the desired color and the monobase product, whose quality is most suitable depending on the use for which the finished paint product is intended (professional or do-it-yourself). The percentages indicated are shown, of course, only for information and are intended to illustrate by the examples the innovative concept on which the present invention is based beginning from the moment when the exact formulas can be obtained experimentally by the manufacturers of varnish products on the basis of the physicochemical characteristics of the compounds and the specific substances forming the binders, fillers, colorants, etc.

[0036] It is important to note that the results that can be obtained with the present invention cannot be obtained by simply adopting a normal transparent or neutral base product of the prior-art systems that measure the dyeing instead of the monobase product according to the present invention. These prior-art transparent base products have, in fact, a rather high filler content and are suitable for preparing dark paints by adding to them small quantities of dark colorants which are known to have a high covering power. If, by contrast, a paint of a pastel color with a satisfactory covering power were to be prepared with a prior-art transparent base, it would be

necessary to add such large quantities of pigment that they would denature the structure of the paint itself and they would at any rate be such that they would lead to an increase in the cost of the paint to unacceptable levels.

[0037] The use for which the varnish or paint product is intended with reference to the present invention determines the type of the monobase product adopted for the entire range of colors of the finished varnish product. Even though the above examples make a distinction between a monobase product of high quality and a monobase product of low quality, it is, of course, possible to have a different dyeing-measuring system intended for producing paints of an intermediate quality relative to those that were illustrated by the above examples, which consequently contain a monobase product of an intermediate quality relative to those mentioned above. The components for the production of paints, which complement the dyeing-measuring system according to the present invention (pigments, titanium white, fillers and possible additives), in addition to the monobase, are supplied in a liquid, easy-to-transport form in containers for liquids which can be handled in a simple manner in the paint production by using, e.g., liquid-dispensing machines of the generally known type.

Example 7

[0038] To obtain a water-based paint product of medium and satisfactory quality for semi-professional use, with a white color, it is necessary to prepare a liquid monobase product and a TiO_2 solution.

[0039] The liquid monobase contains about 24% of a binder emulsion, about 36% of a filler, about 6% of a cellulose pulp and about 12% of additives, all diluted in water, which reaches about 22% of the total volume of the monobase. The monobase is consequently in a liquid form, packaged in cans, and can be easily transported in containers of various sizes.

[0040] The liquid solution of titanium white, TiO_2, contains about 75 vol.% of TiO_2, about 1% of a bactericidal product, about 2% of a dispersing or wetting agent, all diluted in water, which consequently reaches about 22% of the total volume of the TiO_2 solution.

[0041] Given the liquid components (liquid monobase and TiO_2 solution) specified above, a finished varnish or paint product of white color can be obtained by adding and mixing the remaining 20% of the liquid TiO_2 solution necessary to reach the fill level of 100% to a quantity of liquid monobase product equaling 80% of the fill level. The volume percentage of each element within the finished varnish product will consequently equal about 20% (19.2%) of binder emulsion, about 30% (28.8%) of filler, about 15% of TiO_2, about 5% (4.8%) of cellulose pulp, about 10% (10.2%) of additives, all diluted in water taken in an amount equaling about 22% of the total volume of the finished product, given that both the monobase and the titanium white are already supplied in an aqueous solution.

[0042] The percentages of the various elements present in the liquid components that will eventually form the finished paint are reviewed in Table 2 below.

Table 2

Element	**Component: Liquid monobase**	**Component: TiO_2 solution**	**White paint: 80% monobase, 20% TiO_2 solution**
Emulsion	24%	0%	19.2%
Water	22%	22%	22.0%
Filler	36%	0%	28.8%
TiO_2	0%	75%	15%
Cellulose pulp	5%	0%	4.8%
Additives	12%	3% (= 2% + 1%)	10.2%

Example 8

[0043] If paints of different gray hues are to be produced until the black color is reached, always using the liquid monobase according to the above example, it is sufficient to prepare a liquid filler component and a universal black colorant component, in addition to the liquid components indicated above (liquid monobase and TiO_2) solution.

[0044] The liquid filler component contains, e.g., about 68 vol.% of a mixture of products, e.g., filler powders of a known type (the real "filler" element), about 2% of cellulose pulp, 3% of a binder emulsion, about 1% of bactericidal product, and about 1% of a dispersing or wetting agent, all diluted in water, which consequently reaches about 25% of the total volume of the liquid filler component.

[0045] The universal black colorant is of the type generally known in this field and is already supplied in the liquid form, i.e., it can be easily mixed with the other components of the paint. The exact composition of the colorant does not affect the present invention, which justly proposes to optimize the quantity of colorant necessary to obtain the desired finished colored product by reducing the colorant composition to a minimum.

[0046] Given the above-mentioned four liquid components (canned liquid monobase; liquid filler, liquid TiO_2 and liquid black colorant, which can be distributed), it is possible to obtain, e.g.,

- a light gray paint by mixing about 18% of TiO_2 solution and about 2% of black colorant with a canned monobase filled to a fill level of about 80% to thus reach a fill level of 100%;
- a medium gray paint by mixing about 10% of TiO_2 solution and about 4% of black colorant with a canned monobase filled to a fill level of about 80% and by also adding about 6% of liquid filler product to reach the fill level of 100%;
- a dark gray paint by mixing about 4% of TiO_2 solution and about 6% of black colorant with a canned monobase filled to a fill level of about 80% and by subsequently adding about 10% of liquid filler product to reach the fill level of 100%;
- a black paint by mixing about 8% of black colorant and about 12% of liquid filler product with a canned monobase filled to a fill level of about 80%, without any need to add the TiO_2 solution.

[0047] The liquid monobase component is prepared in cans and containers already ready to receive the other components given the substantial constancy of the percentages of the liquid monobase component necessary to obtain paints of any color within the chromatic range. With reference to Examples 7 and 8, it is consequently possible to prepare in a stockroom containers of the desired dimensions that are already filled to 80% of their volume with the liquid monobase component only, which is used to prepare the finished paints.

[0048] Using the system according to the present invention, it is consequently possible to reduce the number of components to be combined during the production of a paint of a desired color in the entire chromatic range. The base principle is to formulate the base as it is conventionally defined from a single monobase for each paint quality by adding to it TiO_2 and/or filler in

predetermined quantities, exceeding or equaling 0% depending on the desired final color, during the preparation of the color itself. This addition of possible quantities of titanium white and of filler component can, of course, be carried out either manually or automatically by means of a dispensing machine, as already happens in the prior-art systems which measure the dyeing, with reference to the distribution of colored pigments in the prior-art bases. The use of the colorant is optimized with the present invention because the colorant is never added in quantities that are larger than the necessary quantity because, contrary to what happens in the conventional systems that measure the dyeing, it is never necessary to counterbalance an excess or a deficit of titanium white. The savings resulting from the use of colorants is immediately reflected by a lower cost of the finished paint and additionally by a less severe environmental impact caused by the general harmfulness of the colorants themselves. Finally, the covering power of the finished paint itself also becomes optimal due to the present invention for each determined quality of finished paint.

[0049] It being understood that the principle of what was found remains valid, the characteristics of the implementation and the embodiments can, of course, also vary compared with what was described, without going beyond the scope of the present invention.

Claims

1. Process for producing paints, especially by mixing predetermined quantities of liquid products, characterized in that it comprises the following phases:

   c) a liquid monobase component containing quantities of a binder element and of a filler element or filler, whose percentages are predetermined, is prepared;
   d) predetermined quantities of at least one liquid component selected from the group comprising:

   - a liquid component containing titanium white, TiO_2, and
   - a liquid component containing a filler element or filler

   are added to the liquid monobase component during the preparation of the finished paint in agreement with a proportional formula optimized and predetermined according to the desired color of the said finished paint.

2. Process in accordance with claim 1, characterized in that it also comprises the following

phase:

c) addition of predetermined quantities of at least one liquid component containing at least one pigment or colorant substance to the liquid monobase component in agreement with the said formula.

3. Process in accordance with claim 2, characterized in that the phases b) and c) are carried out simultaneously.

4. Process in accordance with claim 1, characterized in that the said, proportionally determined quantities of the binder element and the filler element or filler contained in the liquid monobase component depend on the quality of the desired finished paint.

5. Process in accordance with claim 1, characterized in that additive substances such as mildewproofing, antifermentative, siccative, antiskinning compounds, etc., are also added to the liquid monobase component.

6. Process in accordance with claim 1, characterized in that the liquid components contain proportionally predetermined quantities of a solvent.

7. Dyeing-measuring system used to produce colored paints, characterized in that it comprises:

- a liquid monobase component containing predetermined quantities of a binder element and a filler element or filler, the proportion of the said quantities depending on the desired finished paint;
- a liquid component containing titanium white (TiO_2);
- a plurality of liquid components containing at least one pigment or colorant substance;
- a liquid component containing predetermined quantities of a filler component or filler.

8. Liquid base component used to produce paints, characterized in that it contains no titanium white (TiO_2), but it contains a proportionally predetermined quantity of a filler

element or filler which is smaller than the total optimal quantity that makes it possible to obtain a finished paint of black color containing the said liquid component.

9. Liquid base component in accordance with claim 8, characterized in that it contains quantities of binder emulsion, a filler component, a cellulose pulp and additives, whose percentages are predetermined, all being in water or a solvent.

10. Use of a liquid base component in accordance with claim 8 as a liquid monobase component that makes it possible to carry out the process according to claim 1.

11. Use of a liquid base component in accordance with claim 8 as a single liquid monobase component of the dyeing-measuring system according to claim 7.